WHAT IS CLAIMED IS:

1. For use in wireless network communications system comprising a base transceiver station having an adaptive antenna array and a mobile station having a first mobile antenna and a second mobile antenna, an apparatus for improving downlink performance of said adaptive antenna array of said base transceiver station, said apparatus comprising:

a spatial signature estimator associated with said base transceiver station, said spatial signature estimator capable of obtaining a spatial signature from a signal received by said base transceiver station from said first mobile antenna and that is capable of obtaining a spatial signature from a signal received by said base transceiver station from said second mobile antenna; and

correlation circuitry coupled to said spatial signature estimator, said correlation circuitry capable of using spatial signatures obtained from said first mobile antenna and from said second mobile antenna to identify a least changing spatial signature, and capable of using said

least changing spatial signature to obtain a downlink beamforming weight vector.

2. The apparatus as set forth in Claim 1 wherein said spatial signature estimator is capable of obtaining a first set of spatial signatures comprising a first spatial signature from said first mobile antenna and a first spatial signature from said second mobile antenna during a first portion of an uplink interval of a time division duplex slot associated with said first mobile antenna and said second mobile antenna; and

wherein said spatial signature estimator is capable of obtaining a second set of spatial signatures comprising a second spatial signature from said first mobile antenna and a second spatial signature from said second mobile antenna during a second portion of said uplink interval; and

wherein said correlation circuitry is capable of measuring changes in said second set of spatial signatures with respect to said first set of spatial signatures to identify said least changing spatial signature.

3. The apparatus as set forth in Claim 2 wherein said correlation circuitry comprises:

a controller;

a table coupled to said controller, said table capable of storing values of said spatial signatures;

a first spatial correlator coupled to said controller and to said table, said first spatial correlator capable of correlating values of spatial signatures from said first mobile antenna;

a second spatial correlator coupled to said controller and to said table, said second spatial correlator capable of correlating values of spatial signatures from said second mobile antenna;

a comparator coupled to said controller and to said first spatial correlator and to said second spatial correlator, said comparator capable of comparing correlation values from said first spatial correlator and from said second spatial correlator to determine a downlink beamforming weight vector.

4. The apparatus as set forth in Claim 3 wherein said table is a 4M by one table capable of storing values of said spatial signatures, where M is a number of antennas in said adaptive antenna array.

5. The apparatus as set forth in Claim 4 wherein said 4M by one table contains:

M spatial signatures a^1_P representing a first set of spatial signatures obtained from said first mobile antenna;

M spatial signatures a^2_P representing a first set of spatial signatures obtained from said second mobile antenna;

M spatial signatures a^1_C representing a second set of spatial signatures obtained from said first mobile antenna; and

M spatial signatures a^2_C representing a second set of spatial signatures obtained from said second mobile antenna.

6. The apparatus as set forth in Claim 5 wherein said first spatial correlator calculates a correlation value ρ_1 between said spatial signatures $a^1{}_P$ and said spatial signatures $a^1{}_C$ given by:

$$\rho_1 = \left| (a^1{}_C) * (a^1{}_P) \right|$$

where the symbol * represents a process of correlation of two signals.

7. The apparatus as set forth in Claim 6 wherein said second spatial correlator calculates a correlation value ρ_2 between said spatial signatures $a^2{}_P$ and said spatial signatures $a^2{}_C$ given by:

$$\rho_2 = \left| (a^2{}_C) * (a^2{}_P) \right|$$

where the symbol * represents a process of correlation of two signals.

8. The apparatus as set forth in Claim 7 wherein said comparator compares said correlation value ρ_1 and said correlation value ρ_2;

wherein said comparator outputs to said controller a value of zero if said correlation value ρ_1 is greater than or equal to said correlation value ρ_2; and

wherein said comparator outputs to said controller a value of one if said correlation value ρ_1 is less than said correlation value ρ_2.

9. The apparatus as set forth in Claim 8 wherein said controller selects said M spatial signatures a^1_c as components of a downlink beamforming weight vector W if said output value from said comparator is one; and

wherein said controller selects said M spatial signatures a^2_c as components of a downlink beamforming weight vector W if said output value from said comparator is zero.

10. The apparatus as set forth in Claim 9 comprising a downlink beamformer coupled to said controller, said downlink beamformer capable of receiving said downlink beamforming weight vector W from said controller, and capable of complex multiplying an incoming complex data stream S with said downlink beamforming weight vector W, and capable of outputting a resulting complex data stream X to transmit portions of M transceivers associated respectively with M antennas of said adaptive antenna array.

11. For use in wireless network communications system comprising a base transceiver station having an adaptive antenna array and a mobile station having a first mobile antenna and a second mobile antenna, a method for improving downlink performance of said adaptive antenna array of said base transceiver station, said method comprising the steps of:

obtaining in a spatial signature estimator associated with said base transceiver station a spatial signature from a signal received by said base transceiver station from said first mobile antenna;

obtaining in said spatial signature estimator a spatial signature from a signal received by said base transceiver station from said second mobile antenna; and

using spatial signatures obtained from said first mobile antenna and from said second mobile antenna to identify a least changing spatial signature; and

using said least changing spatial signature to obtain a downlink beamforming weight vector.

12. The method as set forth in Claim 11 further comprising the steps of:

obtaining in said spatial signature estimator a first set of spatial signatures comprising a first spatial signature from said first mobile antenna and a first spatial signature from said second mobile antenna during a first portion of an uplink interval of a time division duplex slot associated with said first mobile antenna and said second mobile antenna; and

obtaining in said spatial signature estimator a second set of spatial signatures comprising a second spatial signature from said first mobile antenna and a second spatial signature from said second mobile antenna during a second portion of said uplink interval; and

using correlation circuitry to measure changes in said second set of spatial signatures with respect to said first set of spatial signatures to identify said least changing spatial signature.

13. The method as set forth in Claim 12 wherein said correlation circuitry comprises:

a controller;

a table coupled to said controller, said table capable of storing values of said spatial signatures;

a first spatial correlator coupled to said controller and to said table, said first spatial correlator capable of correlating values of spatial signatures from said first mobile antenna;

a second spatial correlator coupled to said controller and to said table, said second spatial correlator capable of correlating values of spatial signatures from said second mobile antenna;

a comparator coupled to said controller and to said first spatial correlator and to said second spatial correlator, said comparator capable of comparing correlation values from said first spatial correlator and from said second spatial correlator to determine a downlink beamforming weight vector.

14. The method as set forth in Claim 13 further comprising the step of:

storing values of said spatial signatures in said table, wherein said table is a 4M by one table, where M is a number of antennas in said adaptive antenna array.

15. The method as set forth in Claim 14 further comprising the steps of:

storing in said 4M by one table M spatial signatures a^{1}_{P} representing a first set of spatial signatures obtained from said first mobile antenna;

storing in said 4M by one table M spatial signatures a^{2}_{P} representing a first set of spatial signatures obtained from said second mobile antenna;

storing in said 4M by one table M spatial signatures a^{1}_{C} representing a second set of spatial signatures obtained from said first mobile antenna; and

storing in said 4M by one M spatial signatures a^{2}_{C} representing a second set of spatial signatures obtained from said second mobile antenna.

16. The method as set forth in Claim 15 further comprising the step of:

calculating in said first spatial correlator a correlation value ρ_1 between said spatial signatures $a^1{}_P$ and said spatial signatures $a^1{}_C$ given by:

$$\rho_1 = \left| (a^1{}_C) * (a^1{}_P) \right|$$

where the symbol * represents a process of correlation of two signals.

17. The method as set forth in Claim 16 further comprising the step of:

calculating in said second spatial correlator a correlation value ρ_2 between said spatial signatures $a^2{}_P$ and said spatial signatures $a^2{}_C$ given by:

$$\rho_2 = \left| (a^2{}_C) * (a^2{}_P) \right|$$

where the symbol * represents a process of correlation of two signals.

18. The method as set forth in Claim 17 further comprising the steps of:

comparing said correlation value ρ_1 and said correlation value ρ_2 in said comparator;

outputting from said comparator to said controller a value of zero if said correlation value ρ_1 is greater than or equal to said correlation value ρ_2; and

outputting from said comparator to said controller a value of one if said correlation value ρ_1 is less than said correlation value ρ_2.

19. The method as set forth in Claim 18 further comprising the steps of:

selecting in said controller said M spatial signatures $a^1{}_c$ as components of a downlink beamforming weight vector W if said output value from said comparator is one; and

selecting in said controller said M spatial signatures $a^2{}_c$ as components of a downlink beamforming weight vector W if said output value from said comparator is zero.

20. The method as set forth in Claim 19 further comprising the steps of:

receiving in a downlink beamformer coupled to said controller said downlink beamforming weight vector W from said controller;

complex multiplying in said downlink beamformer an incoming complex data stream S with said downlink beamforming weight vector W;

outputting from said downlink beamformer a resulting complex data stream X to transmit portions of M transceivers associated respectively with M antennas of said adaptive antenna array.